

Norio SAHASHI\*: **Morphological and taxonomical studies  
on Ophioglossales in Japan and the adjacent regions (6)\*\***

**Examination of *Sceptridium daucifolium* (1)**

佐橋紀男\*: 日本および近隣産ハナヤスリ目の

形態学的分類学的研究 (6)

ホウライハナワラビ類の検討 (1)

*Botrychium daucifolium* Wall. was published by Hook. et Grev. in Icon. Fil. tab. 161 (1829). The specimen from which the illustration was drawn is now preserved in the Edinburgh herbarium (E) and the syntypes are deposited in the British Museum (BM), London (Fig. 1). They have some characteristic features in common, such as short stalked sterile blade which is inserted medially or somewhat distally, and is little or not at all exceeded by the fertile segment. These essential characteristics are also observed in the same species from eastern Himalaya, southeastern India, Indo-China and Sri Lanka (Fig. 2. D). However, the plant which has been known as *B. formosanum* Tagawa 1940 [Fig. 3. D; afterward Tagawa (1948) recognized this as a synonym of *B. daucifolium*] has somewhat long stalked sterile blade which is inserted below the middle of the plant, about one-third the length from the base of the plant. Furthermore, the plants which have been reported from many islands of Indonesia, North Borneo, the Philippines and some islands of the South Pacific are very hairy when young (Fig. 5. A), and the fertile segments usually exceeding the sterile segments by about 10 cm at maturity, and the spores are about 5  $\mu$ m larger than the typical ones. From investigations on *B. daucifolium* sensu lato at many herbaria and gardens, and from many field works at natural habitats in Southeastern Asia and Oceania, the author concludes that the following 3 species with 2 varieties are recognized in the *Sceptridium daucifolium* complex.

A. Common stalk long, as long as a half or longer the height of the plant.

Sterile stalk short, usually up to 4 cm long.

B. Fertile segment exceeding sterile segment, spores 25-32  $\mu$ m in E.

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\*\* Continued from Journ. Jap. Bot. 56: 129-136 (1981).



Fig. 1. Syntype specimens of *Botrychium daucifolium* Wall. ex Hook. et Grev., deposited in BM.

- diameter ..... 3. *S. javanicum*
- B. Fertile segment little or not at all exceeding the sterile segment, spores 21-26  $\mu\text{m}$  in E. diameter..... 1a. *S. daucifolium* var. *daucifolium*
- A, Common stalk short, as long as one-third the height of the plant.
- B. Fertile segment exceeding the sterile segment.
- C. Spores 25-35  $\mu\text{m}$  in E. diameter. Margin of pinna usually serrate

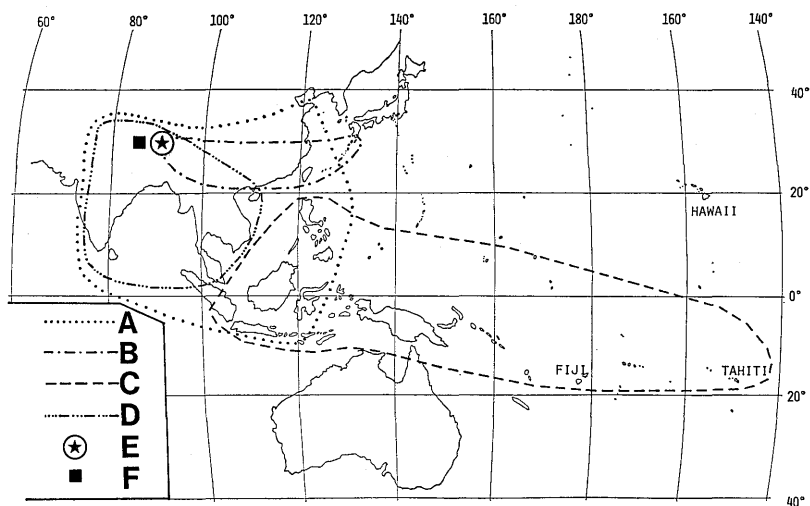


Fig. 2. Distribution of the 3 species and 2 varieties of Sect. *Sceptridium* found in S.E. Asia and Malaysia. A. *Botrychium daucifolium*, according to Jermy & Walker (1977). B. *Sceptridium formosanum*. C. *S. javanicum*. D. *S. daucifolium* var. *daucifolium*. E. *S. daucifolium* var. *intermedium*. F. *S. daucifolium* var. *kanaii*.

.....lb. *S. daucifolium* var. *intermedium*

C. Spores 32–40  $\mu\text{m}$  in E. diameter. Margin of pinna almost entire

.....lc. *S. daucifolium* var. *kanaii*

B. Fertile segment little or not at all exceeding the sterile segment. Spores 19–25  $\mu\text{m}$  in E. diameter..... 2. *S. formosanum*

1. ***Sceptridium daucifolium*** (Wall.) Lyon, Bot. Caz. 40: 457 (1905).

*Botrychium daucifolium* Wall. ex Hook. et Grev., Icon. Fil. tab. 161 (1829)  
—Beddome, Handb. Ferns Brit. Ind. 469 (1883)—Prantl, Jahrb. Bot. Gart. Berlin 3: 339 (1884)—Underwood, Bull. Torrey Bot. Club 25: 535 (1898)—Clausen, Mem. Torrey Bot. Club 19: 60 (1938); Amer. Fern Journ. 33: 25 (1943)—Allen, Gard. Bull. Singap. 17: 251 (1959)—Panigrahi & Dixit, Proc. Nat. Inst. Sci. India 35: 237 (1969)—Abeywickrama & Fonseka, Ceylon Journ. 10: 135 (1973)—Malla et al. Bull. Dept. Med. Plants Nepal 7: 2 (1976)—Jermy & Walker, Gard. Bull. Singapore 30: 295 (1977).

1a. var. ***daucifolium*** (Figs. 1, 6. C).

*Sceptridium daucifolium* var. *parvum* (non v. A. v. R.) Nishida, Journ. Jap. Bot. 41: 319 (1966); Fl. E. Himal. 454 (1966).

Plant lax to rather stout, hairy to glabrescent; rhizome small erect, 1 (0.5-2) cm high; common stalk (phyllomophore) elongate, 20 (7-30) cm long, often up to 40 cm; sterile stalk usually short, 2.5 (0.5-7) cm long; blade ternately divided, often two lower divisions alternate, subcoriaceous in texture, 17 (5-29) cm wide, 14 (5-22) cm long; penultimate segments elongate, acute; ultimate segments oblong, blunt to acutish with coarsely or finely serrate or toothed margin; fertile stalk 10 (3-24) cm long; fruiting spike 8 (2-16) cm long; sporangia less than 1.0 mm in diameter; spores normal, trilete, 21-26  $\mu$ m in equatorial diam.; chromosomes  $n=90$  (Manton & Sledge, Phil. Trans. B. 238: 135, 1954).

Type in E and BM (Fig. 1).

Range: Himalaya, India, Sri Lanka and Indo-China. In E. Himalaya it usually occurs at altitudes from 700 to 2400 m and ripens from October to the end of March.

Nishida's var. *parvum* from E. Himalaya has small spores and more glabrous than the small Indonesian var. *parvum* Rosenburgh from Java (Fig. 6. A & C).

lb. Var. **intermedium** Sahashi, var. nov. (Fig. 4. C).

Simile var. *daucifolio* et *S. japonico*, sed differt ab anteriore: paniculis longioribus laminis sterilibus, petiolis laminarum sterilibus elongatis ad 9 cm longis, sporis magnis (Fig. 7. C, D), ad ca. 33  $\mu$ m; a posteriore: stipite elongatos ad 13 cm longo, rhizomate brevi, ad 2 cm longo.

Plant lax to rather stout, more or less hairy, 33 (24-45) cm high; rhizome small, 1 (0.5-2) cm high; common stalk 10 (6-13) cm long, about one-third of the length of the plant; sterile stalk 6 (4-9) cm long; blade ternately divided, subcoriaceous, 11 (8-18) cm wide, 10 (6-15) cm long; penultimate segments elongate, acutish and finely serrate; fertile stalk 16 (14-21) cm long; fruiting spike 7 (4-12) cm long; spores normal, trilete, 25-33  $\mu$ m in equatorial diam.; chromosome number unknown.

Type: Takdah, Darjeeling, E. India, ca. 1700 m, 18 Apr. 1960 (TI; no. 2457, two plants are mounted on one sheet, the one at right is the holotype).

Specimens examined: Collected at the same locality as the holotype, 19 Apr. 1960 (KYO; no. 2457); Dumhan-Taplejung, E. Nepal, 700-2400 m, 1 Nov. 1963 (TI; four plants in one sheet, second plant at the right is this variety, others are var. *daucifolium*).

Range: Darjeeling and E. Nepal. Some specimens intermediate between



Fig. 3. A-C. *Sceptridium javanicum*. A. Habitat at the type locality; humid shaded place in Isl. Bali. B. Habitat of a small plant growing in damp shadow virgin forest at the foot of Mt. Gede, Isl. Java. C. A large plant, collected at the foot of Mt. Kinabaru, Sabah, Isl. Borneo. D-F. *S. formosanum*. D. Holotype in KYO. E. Habitat of young plant; humid and shaded place in virgin forest at Urai, Taiwan. F. Habitat of mature plant in shaded swampy place in Isl. Okinoerabujima, Ryukyus.

var. *intermedium* and var. *daucifolium* were found in BM (1 plant), K (2 plant), and P (3 plants). All of them were collected from Sri Lanka. In these pressed specimens the author could not find any reliable differences from var. *daucifolium*, so he treated these doubtful specimens as var. *daucifolium* in this paper.

1c. Var. **kanaii** Sahashi, var. nov. (Fig. 4. B).

Simile var. *daucifolio*, sed differt paniculis longioribus laminis sterilibus; ornamentis sporarum reticulatis et magnis, ad ca. 40  $\mu$ m (Pl. II. I & J); pinnis

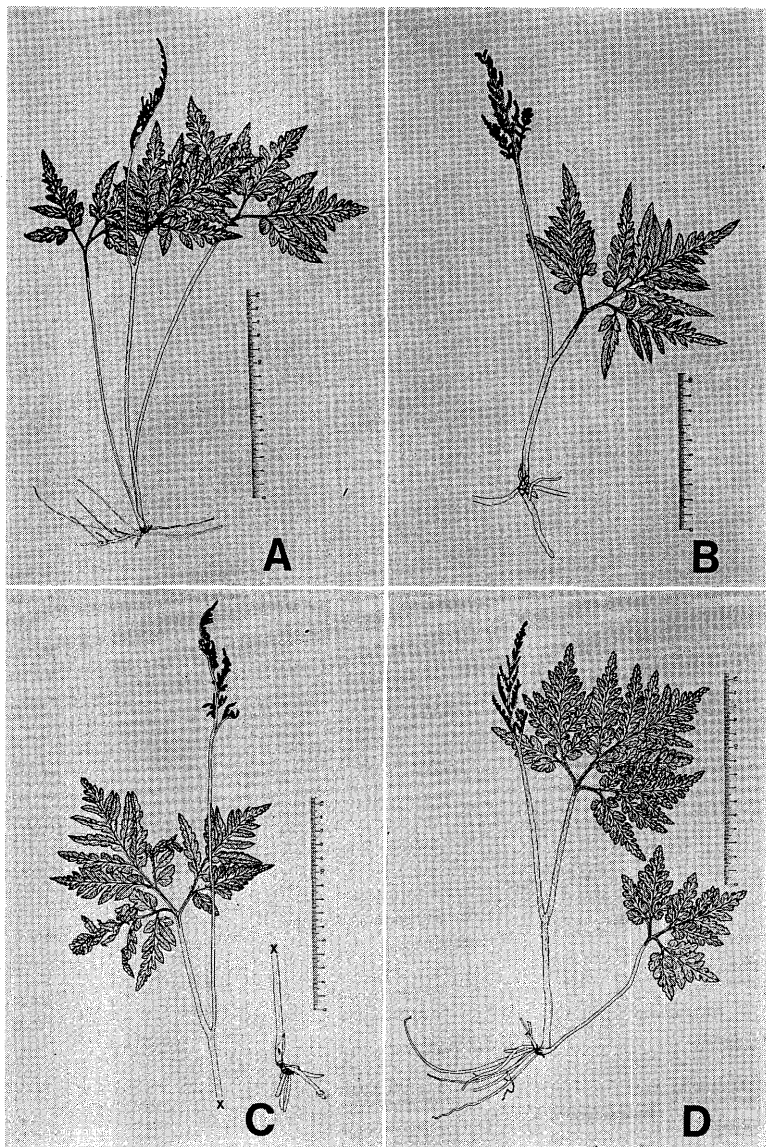


Fig. 4. A. *Sceptribidium javanicum*, type specimen from Candikuning, Isl. Bali. (TNS; no. 365710). B. *S. daucifolium* var. *kanaii*, type specimen from Sundarijar, Kathmandu, Nepal. (TI; no. 16685). C. *S. daucifolium* var. *intermedium*, type specimen from Takdah, Darjeeling, E. India. (TI; no. 2457). D. *S. formosanum* from Isl. Tokunoshima, Ryukyus (TOHO; no. 7812205).

elongatis, apice acutis, margine subintegrus vel minute serratis.

Plant rather stout, very hairy, about 30 cm high; common stalk 9 cm long, densely lanuginose; sterile stalk 4 cm long; blade ternately divided, subcoriaceous in texture, 16 cm wide, 14 cm long; penultimate segments much elongate, acute and barely cut at the upper portions, with the margins almost entire or inconspicuously serrate; fertile stalk 13 cm long; fruiting spike about 9 cm long; spores normal, trilete to often intermediate to monolete, 32–40  $\mu\text{m}$  in equatorial diam.; chromosome number unknown.

Type: Sundarijar, Kathmandu, Nepal, 1950 m, in shady humid place, 13 Feb. 1969 (TI; H. Kanai no. 16685).

2. **Sceptridium formosanum** (Tagawa) Holub, Preslia 45: 277 (1973). (Figs. 3. D-F, 4. D, 6. B).

*Botrychium formosanum* Tagawa, Acta Phytotax. Geobot. 9: 87 (1940)—H. Ito, Journ. Jap. Bot. 18: 199 (1942).

*Botrychium daucifolium* (non Hook. et Grev.) Clausen, Amer. Fern Journ. 33: 25 (1943)—Tagawa, Journ. Jap. Bot. 22: 160 (1948)—De Vol, Fl. Taiwan 1: 64 (1975).

*Sceptridium daucifolium* (non Lyon) Nishida, Amer. Fern Journ. 50: 130 (1960)—Hatusima, Fl. Ryukyus, 127 (1971)—Serizawa, Sci. Report Takao Mus. Nat. Hist. 7: 8 (1975)—Sahashi, Journ. Jap. Bot. 51: 331 (1976)—Nakaike, Ohwi Fl. Jap. 247 (1978).

*Botrychium japonicum* (non Und.) Matsumura, Index Plant. Jap. 297 (1904)—Nakai, Bot. Mag. Tokyo 40: 382 (1926)—H. Ito, Bot. Mag. Tokyo, 53: 71 (1939); Fil. Jap. Illust. pl. 507 (1944)—De Vol, Fl. Taiwan 1: 65 (1975).

Plant lax to rather stout, hairy in younger plant (Fig. 5. B), 39 (15–58) cm high; rhizome erect, 1.7 (0.5–3.5) cm high; common stalk 12 (4–20) cm long, sparsely lanuginose; sterile stalk 8 (6–15) cm long, sometimes only 2 cm long in the small plant; blade ternately to subternately divided, thick herbaceous or often membranous, 20 (6–42) cm wide, 16 (5–34) cm long; penultimate segments usually broadly lanceolate, acutish; ultimate segments oblong to ovate, obtuse to often acutish, with irregularly serrate or toothed; fertile stalk 14 (5–23) cm long; fruiting spike 11 (4–20) cm long, sporangia less than 1 mm in diam.; spores normal, trilete, 19–25  $\mu\text{m}$  in equatorial diameter; chromosomes  $n=90$ .

Type: Baribugai, Taito-gun, Taiwan, 5 Feb. 1940 (KYO; M. Tagawa, no.

2912 holotype). Paratypes are also deposited in KYO, BM and Chiba University.

Range: From northern part of Kagoshima Pref. (Serizawa no. 13629 in AICH) in Kyushu, through Ryukyu Islands to Taiwan, S. China and probably rare in E. Himalaya.

This differs from *S. daucifolium* var. *daucifolium* in having the blade inserted below the middle of the plant with the longer stalk, in the finer cutting of the blade and in the thinner texture.

3. ***Sceptridium javanicum*** Sahashi, sp. nov. (Figs. 3. A-C, 4. A, 5. A, 6. A).

*Botrychium daucifolium* (non Hook. et Grev.) v. A. v. R. Malayan Ferns 778 (1908)—Copeland, Fern Fl. Philippines 1: 20 (1958)—Parham, Plant Fiji Isl. 25 (1972)—Iwatsuki & Kato, Acta Phytotax. Geobot. 31: 25 (1980).

Planta laxa vel aliquantum valida, 39 (14–60) cm alta, interdum non nisi 7 cm alta. Rhizoma breve, erectum, 1 (0.5–2) cm longum. Stipes hirsutus, 16 (6–27) cm longus. Petiolus laminae sterilis brevis, 4 (1.5–7) cm longus. Lamina sterilis tripinnatifida, subcoriacea, 15 (8–24) cm longa, 17 (9–25) cm lata. Pinnae late lanceolatae, apice acutae. Pinnulae ovatae vel oblongae, apice obtusae vel saepe acutae, margine grosse serratae vel irregulariter dentatae. Panicula fertilis saepe non expansa, 11 (3–18) cm longa, petiolo 12 (5–20) cm longo. Sporangia minota quam 1 mm diametro. Sporae triletae, diametro 25–32  $\mu\text{m}$ . Chromosomatum numerus  $n=\text{ca. } 180$ .

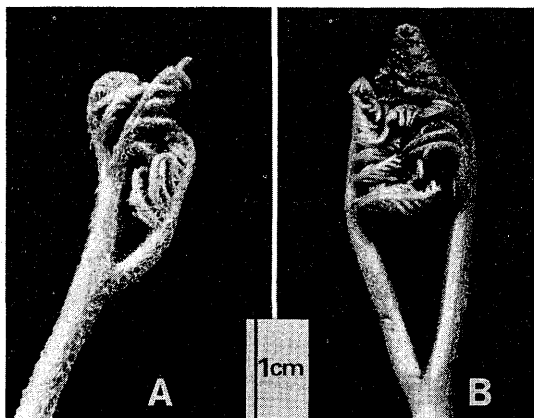


Fig. 5. Photographs of young shoots of *Sceptridium*. A. *S. javanicum* from Isl. Bali; quite densely pubescent. B. *S. formosanum* from Taiwan; a little densely pubescent.



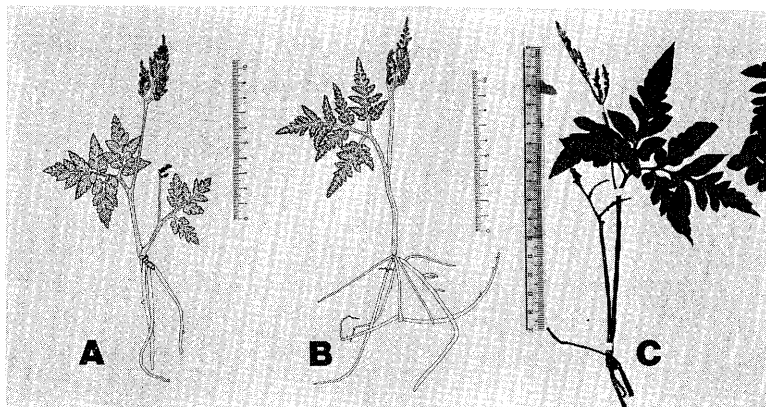


Fig. 6. A. *Sceptridium javanicum* from Isl. Lombok, a small plant, material for cytological study. B. *S. formosanum* from Taiwan, a small plant, material for cytological study. C. *S. daucifolium* var. *daucifolium* from E. Nepal, treated by Nishida (1966) as var. *parvum*. (KYO; no. 6305417).

Type: Candikuning, near Bratan Lake, Isl. Bali, 1500 m, 10 Aug. 1978 (TNS; Sahashi no. 365710, holotype) ; Same locality (TOHO; Sahashi no. 7808102) ; Bedugul, Isl. Bali, 1200 m, 11 Aug. 1977 (TOHO; Akiyama no. 7708111) ; Tibodas, Mt. Gede, Isl. Java, 1700 m, 5 Aug. 1978 (TOHO; Sahashi no. 7808051) ; Mt. Rinjani, Isl. Lombok, 1300 m, 9 Aug. 1977 (TOHO; Akiyama no. 7708091).

Range: Indonesia (almost all of the main islands), East Malaysia (Borneo), Philippines (Luzon) and Polynesia (Samoa, Fiji and Tahiti).

This species agrees with *S. daucifolium* var. *daucifolium* in having short stalked sterile blade inserted towards the middle of the plant and the shape of penultimate segment, but differs from it in the fertile segment exceeding the sterile segment at about 10 cm long, more hairy shoots especially when young (Fig. 5. A), large equatorial size of the spores, and chromosome number ( $n = ca. 180$ ) which is the largest one in Sect. *Sceptridium*.